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Award Number: DAMD17-96-1-6071

TITLE: Racial and Ethnic Differences in Breast Cancer Risk Factors

PRINCIPAL INVESTIGATOR: Esther M. John, Ph.D.

CONTRACTING ORGANIZATION: Northern California Cancer Center
Union City, California 94587-6500

REPORT DATE: July 2000

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	July 2000	Annual (1 July 1999 – 30 June 2000)

4. TITLE AND SUBTITLE
Racial and Ethnic Differences in Breast Cancer Risk Factors

5. FUNDING NUMBERS
DAMD17-96-1-6071

6. AUTHOR(S)
Esther M. John, Ph.D.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Northern California Cancer Center
Union City, California 94587-6500

E-MAIL:
ejohn@nccc.org

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel
Command Fort Detrick, Maryland 21702-5012

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 Words)*

Data collection was recently completed for a population-based case-control study of breast cancer which was funded by the Department of Defense, the National Cancer Institute, and the California Breast Cancer Research Program. Breast cancer cases were identified through the cancer registry covering the San Francisco Bay Area and include Latina, African-American and White women aged 35-79 years diagnosed with invasive breast cancer between 1995 and 1998. Controls were identified through random-digit dialing and frequency-matched to cases on ethnicity and age. Study participation involved an in-person interview on physical activity, vitamin D exposures (sun exposure, dietary intake), phytoestrogen intake, and other risk factors, and measurements of anthropometry and skin pigmentation. The interview was completed by 1,326 cases (469 Latinas, 409 African-Americans, 448 Whites) and 1,657 controls (699 Latinas, 460 African-Americans, 498 Whites). Data analyses examining the risk factor profile among Whites (high risk), African-Americans (moderate risk), and Latinas (low risk) are currently in progress. This study will make an important contribution to the sparse epidemiologic literature on breast cancer risk factors in African-American and Latina women.

14. SUBJECT TERMS
epidemiologic, anthropometry, physical activity and vitamin D exposures

15. NUMBER OF PAGES
44

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unclassified

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

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7-26-00

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Table of Contents

1. INTRODUCTION

1.1. Background

Breast cancer incidence rates in the San Francisco Bay Area are among the highest in the world [1]. In 1997, breast cancer affected 133.6 per 100,000 White women, the racial-ethnic group with the highest incidence rate, and as the leading incident cancer in women accounted for 33.4% of all cancers diagnosed in Bay Area White women from 1993-1997 [2]. Although incidence rates (per 100,000) are lower in African-Americans (102.7), Asians (76.0), and Latinas (74.8), breast cancer is the leading cancer in these populations as well, accounting for 29-30% of all cancers diagnosed in these populations [2].

The pronounced racial-ethnic differences in breast cancer incidence between Latinas, African-Americans, and White women remain largely unexplained. Relatively few analytic studies of breast cancer with an etiologic focus have been conducted in multiethnic populations and not all studies presented separate results for Latina [3-4] and African-American [6-18] populations that allow for racial/ethnic comparisons of risk factors. It therefore is not known to what extent the differences in incidence rates are attributable to racial/ethnic differences in (1) the magnitude of relative risks associated with known and suspected risk factors, (2) the prevalence of known and suspected risk factors, (3) the magnitude of relative risks and/or prevalence of risk factors yet to be identified, and (4) genetic susceptibility.

1.2. Purpose of On-going Research

The San Francisco Bay Area offers a unique opportunity to conduct etiologic research in a multiethnic population given the large number of breast cancer cases diagnosed each year, 25% of whom are non-White. In the Fall of 1999, we completed data collection for a large population-based case-control study in Latina, African-American, and White women that began in 1995 and was funded by the Department of Defense (DAMD17-96-1-6071, PI: Esther M. John), the National Cancer Institute (R01 CA63446, PI: Esther M. John), and the California Breast Cancer Research Program (1RB0125, PI: Pamela Horn-Ross).

The purpose of this case-control study was to collect interview data on a broad array of known, suspected, and newly hypothesized factors to examine racial/ethnic differences in breast cancer risk factors in a large multiracial/ethnic population from a single geographic area. This research will make a significant contribution to the lack of knowledge about the etiology of breast cancer in non-white populations and will help elucidate the reasons for the striking racial/ethnic differences in breast cancer incidence.

2. BODY

2.1. Technical Objective 1: ***Recruit 330 African-American and 365 White breast cancer cases and equal numbers of controls and obtain interview and anthropometric data on the established and newly hypothesized risk factors.***

Data collection for the overall study began in May 1996 and was completed in the fall of 1999. All work related to Tasks 1-8 in the Statement of Work have been completed. Specific

accomplishments are described below for the overall study (funded by DOD, NCI, and BCRP), with special reference to the study population meeting the eligibility criteria for the DOD funded component.

2.1.1. Case ascertainment

A total of 7,591 patients aged 35-79 and newly diagnosed with histologically confirmed, primary invasive breast cancer between April 1, 1995 and April 30, 1998 were identified through the population-based cancer registry covering the San Francisco Bay Area. Of these, 4,902 met the eligibility criteria for the DOD component. Among the reported cases, 297 (3.9%) were deceased at the time of contact.

2.1.2. Physician consent

As required by the cancer registry, each breast cancer patient's physician listed on the cancer abstract was contacted to inquire about medical or psychological contraindications prior to our contacting his or her patient. Physician-reported contra-indications were obtained for 120 (1.6%) cases.

2.1.3. Control ascertainment

Population controls were identified through random-digit dialing (RDD). We processed a total of 74,673 random numbers which were dialed up to ten times. Among the 45,378 (60.8%) telephone numbers assessed as residential, nobody was reached at 10,012 numbers despite 10 attempts (i.e., no answer or answering machine only). Among the remaining 35,366 phone numbers where a household member was reached, a household enumeration was completed for 28,775 (81.4%) telephone numbers. Among potentially eligible controls, 2,389 were randomly selected according to the race/ethnicity and 5-year age distribution of cases. Among African-Americans and Whites, controls were matched to cases in an approximate ratio of 1.1 controls per case; among Latinas, the ratio was 1.5 controls per case.

2.1.4. Study contact.

Breast cancer patients without physician-reported contraindications and RDD controls selected into the study were sent a letter inviting them to participate in an in-person interview conducted at the participant's home or elsewhere if preferred.

2.1.5. Screening interview

Trained professional interviewers tried to contact the 7,174 alive cases with physician consent by telephone to administer a brief screening questionnaire that inquired about current age, racial/ethnic background, adoption status, Jewish heritage, personal history of breast or ovarian cancer, and history of cancer in first-degree relatives. A total of 6,157 (85.8%) cases completed the screening interview. Among the remaining cases, 487 (6.8%) were too ill or refused participation, 54 (0.8%) did not speak English or Spanish, 359 (5.0%) had moved or could not be located, 100 (1.4%) could not be reached despite more than 10 attempts, and 17 were not screened due to end of study.

Of the 2,389 controls selected into the study, 13 were deceased by the time they were

contacted to participate in the study. Among the remaining 2,376 controls, 2,062 (86.8%) completed the brief telephone screening interview, 168 (7.1%) were too ill or refused to participate, 129 (5.4%) had moved or could not be located, 8 did not speak English or Spanish, and 9 could not be reached before the end of the study.

2.1.6. Home interview

Women eligible for an in-person interview, which was usually conducted at the participant's home, included all cases who self-identified as Latina (n=536) or African-American (n=480), as well as a 10% random sample of cases who self-identified as White (n=523). The in-person interview involved the administration of the consent form, the completion of a structured questionnaire, and the measurement of anthropometry (i.e., weight, height, waist and hip circumferences), and skin pigmentation using a Minolta Chromameter. The questionnaire inquired about demographic background, physical activity, sunlight exposure, diet, supplement intake, anthropometry, residential history, occupational history, pregnancy history, menstrual history, hormone use, and medical history. The interview and measurements took 2 to 2 1/2 hours to administer for most participants. All study participants received a compensation of $25.00 for their time and effort in completing the home interview.

The in-person interview was completed by 1,326 (86.2%) cases, including 469 (87.5%) Latinas, 409 (85.2%) African-Americans, and 448 (85.7%) Whites. Interviews were not completed due to refusal (n=149), illness (n=42), end of study (n=15), and inability to locate (n=6). Of the cases who met the DOD eligibility criteria, 634 completed the in-person interview (323 Whites, 311 African-Americans) which is slightly lower than the projected number in the grant proposal which was based on several assumptions regarding vital status 9-12 months after diagnosis, ability to locate case, and participation rate.

Controls invited to participate in the in-person interview included 808 Latinas, 562 African-Americans, and 603 Whites. Of these, 1,657 (84.0%) controls completed the home interview, including 699 (86.5%) Latinas, 460 (81.9%) African-Americans, and 498 (82.6%) Whites. Control interviews were not completed for the following reasons: 251 refused, 30 were too ill, 15 could not be located, 19 were not completed due to end of study.

2.1.7. Quality control

Several quality control procedures were implemented to ensure the collection of high quality data. (1) All interviewers participated in a thorough training course conducted by the Principal Investigator and Program Manager to ensure data collection according to a standardized protocol. (2) Interviewers met every two weeks with the Program Manager to discuss progress and quality of the completed work. (3) Interviewers participated in quarterly staff meetings, or more often as needed, to discuss specific issues arising in the field (e.g., refusals, no-shows, home visits, organization of work load, incentives, etc), and they participated in refresher sessions on specific questionnaire items and measurements. (4) Each interviewer was observed on several occasions by the Program Manager while conducting an interview in the field. A report on the observation was prepared and discussed with the interviewer. (5) Each completed questionnaire was edited by the interviewer immediately following the interview. (6) Each edited questionnaire was reviewed by the Program Manager. Missing data items and obvious error and inconsistencies in answers were identified and clarified by re-contacting the study participant. (7) Equipment (i.e., scales, chromameters) were periodically calibrated by office staff. (8) A sample of study participants was re-contacted and questioned about specific sections of the questionnaire. (9)

Double data entry was performed in order to identify data entry errors.

2.1.8. Data management

Progress in RDD and data collection (e.g., screening, in-person interview, measurements) was monitored through two computerized FOXPRO tracking systems. Data entry of screening and questionnaire data was also performed through FOXPRO data entry screens.

In preparation of the statistical analyses, the raw data were cleaned, exposure and confounder variables were defined, and analytic data files were created.

2.2. Technical Objective 2a: *Compare breast cancer risk factors among cases and controls with regard to racial/ethnic differences in the magnitude of association with the established and newly hypothesized risk factors.*

Established risk factors considered in this proposal include demographic factors (age, education, country of birth), menstrual factors (age at menarche, menopausal status, age at menopause), reproductive factors (age at first birth, parity, lactation), hormone use (oral contraceptives, hormone replacement therapy, body mass index (BMI), lifetime weight gain, history of benign breast disease, and family history of breast cancer among first-degree relatives.

Newly hypothesized risk factors considered in this proposal include physical activity, vitamin D, and dietary phytoestrogen intake.

Statistical approach. We used unconditional logistic regression modeling to calculate odds ratios (OR) and 95% confidence intervals (CI) as an estimate of relative risk, while adjusting for potentially confounding risk factors. The final models adjusted for age (five-year age groups), age at menarche (8-11,12-13,≥14), number of full-term births (0,1-2, 3-4,≥5), lactation (0 months, <6, 6-11,≥12), previous biopsy for benign breast disease (yes, no), family history of breast cancer among first-degree relatives (yes, no), highest level of education (some high school or less, high school graduate, some college or vocational school, college grad), and a composite variable of menopausal status, body mass index (BMI), and use of hormone replacement therapy (premenopausal and BMI <28.5; premenopausal and BMI ≥28.5; postmenopausal, no HRT, and BMI <28.5; postmenopausal, no HRT, and BMI ≥28.5; postmenopausal, HRT use, and BMI <28.5; postmenopausal, HRT use, and BMI ≥28.5).

The statistical analysis is underway and we report here the first results (Tables 1-14), some of which were presented at the Era of Hope conference in June 2000.

2.2.1. Demographic factors (Table 1)

As has been reported for other migrant populations, we found a significantly lower risk of breast cancer among foreign-born Latina women (multivariate adjusted OR=0.59).

In older studies, high education has been consistently associated with increased risk. In our study, breast cancer risk varied little by educational level among White and African-American

women, which has been noted in other recent studies as well. One might expect this finding under the assumption that education is a surrogate measure for other lifestyle factors such a reproductive history, and given that reproductive characteristics (i.e., parity, age at first birth) no longer show the wide variation in contemporary cohorts as they used to in older cohort. Among Latinas, which show much greater variation in reproductive characteristics, college graduates had a significantly increased risk (OR=1.56). This finding is in agreement with older studies done in White women.

2.2.2. Menstrual factors and reproductive surgeries (Table 2)

Consistent with the epidemiologic literature, late age at menarche was associated with a decreased risk of breast cancer, with similar ORs found for the three ethnic groups (ranging from 0.68 to 0.88). Among postmenopausal women, late age at menopause was associated with increased risk, as one would expect based on other studies. This finding was, however, limited to Latinas and White women. Among African-American women, there was not trend of increasing risk with increasing age at menopause. Overall, risk was similar for women with natural menopause compared to women with surgical menopause.

The literature on the effects of reproductive surgeries is inconsistent. In our study, a history of hysterectomy slightly reduced risk among Whites (OR=0.77) and African-Americans (OR=0.90), but not among Latinas (OR=1.23). Oophorectomy slightly increased risk among Whites (OR=1.16) and Latinas (OR=1.27), but not among African-Americans (OR=0.84). It is generally recognized, however, that it is difficult to obtain reliable and valid self-reports on past reproductive surgeries.

2.2.3. Reproductive factors (Table 3)

As reported in many older studies, breast cancer risk was lower among parous women compared to nulliparous women. We found a strong protective effect among Latinas (OR=0.59), a moderate protective effect among African-Americans (OR=0.81), but no effect among Whites (OR=1.02). It is of interest to note here that among control women, the proportion of nulliparous women varied greatly among the 3 ethnic groups (6%, 12%, and 19%, respectively). Nulliparous women include those who are childless by choice and those with fertility problems. The distribution of these factors may vary in the 3 ethnic groups included in this study.

We found a strong parity effect among Latina women. Those with 5 or more children had a significant decrease in breast cancer risk (OR=0.34). A more moderate affect was found among African-Americans (OR=0.60). By contrast, among White women, the number of children born was not associated with breast cancer risk. Similarly, among White women, age at first birth was not associated with risk. No clear trend was found among African-Americans. Among Latinas, there was a trend of increasing risk with increasing age at first birth, with the exception of the highest age category (age 30+). More detailed analyses of the reproductive factors are underway.

2.2.4. Lactation (Table 4)

Duration of lactation was inversely associated with breast cancer risk among Latinas and Whites in a dose-response fashion. Lactation for 12 months or longer was associated with a very strong protective effect among Latinas (OR=0.24), and a more moderate effect among Whites (OR=0.68). A trend of decreasing risk was also observed among African-Americans, with the exception of the highest duration category.

When restricting the analysis to parous women, a dose-response trend was evident among White women only, with an OR=0.66 for women who lactated for 12 months or longer.

2.2.5. Hormone use (Table 5)

Consistent with most other studies, oral contraceptive use not associated with increased breast cancer risk in any of the 3 ethnic groups. Among Latinas and African-Americans, use of hormone replacement therapy was associated with a slightly decreased risk, whereas among Whites HRT use slightly increased risk.

2.2.6. Body composition (Table 6)

Measurements of height and weight were taken at the time of the interview using standardized scales and stadiometers. Height was measured three times, and weight was measured twice. The measurements were averaged to compute the body mass index (BMI) as an index of body size (weight in kilograms divided by the square of height in meters). For study participants who declined the anthropometric measurements, information on self-reported height and weight was used. BMI was categorized according to the tertile distribution among all control women.

As reported by others, among premenopausal Latina and White women, high BMI was associated with decreased breast cancer risk. No such reduction was seen in African-American women. When restricting the analysis to premenopausal women who reported HRT use, more consistent inverse trends with BMI emerged. Among postmenopausal women, BMI was not associated with increased breast cancer risk. However, restricting the analysis to postmenopausal women who never used HRT, a strong association with BMI emerged among Whites, but only slight increases in risk among Latinas and African-Americans.

Lifetime weight gain was estimated as the difference between the highest and lowest weight since age 25. Weight gain was not associated with breast cancer risk in our study.

More detailed analyses on this topic are underway.

2.2.7. Caloric intake (Table 7)

High caloric intake of 2357 or more calories per day slightly increased breast cancer risk among African-Americans (OR=1.34) and Latinas (OR=1.10). No positive association was noted for Whites (OR=0.93).

2.2.8. Medical factors (Table 8)

A history of biopsy for benign breast disease (i.e., cyst or breast lump that was not cancer) slightly increased risk, with similar ORs among Latinas (OR=1.21), African-Americans (OR=1.18), and Whites (OR=1.34). A family history of breast cancer in first-degree relatives slightly increased risk among Whites (OR=1.29) and African-Americans (OR=1.16). A considerably stronger association was noted among Latinas (OR=1.85). However, the prevalence of a positive family history among control women varied considerably among the 3 ethnic groups (15%, 13%, 7%, respectively), possibly suggesting unreliable self-reports among Latinas.

2.2.9. Physical activity in premenopausal women (Table 9)

Average lifetime physical activity was estimated based on the number of hours per week spent in leisure-time sports and exercise, moderate to strenuous household and outdoor chores, walking and bicycling to school or work, and moderate or strenuous jobs. Physical activity from all sources for 20.8 hours or more per week reduced risk in Latinas (OR=0.70), African-Americans (OR=0.65) and Whites (OR=0.81). Exercise and sports, however, were not associated with decreased risk. More detailed analyses by intensity of activity and timing of activity are currently under way.

2.2.10. Physical activity in postmenopausal women (Table 10)

Slightly weaker risk reductions were noted among postmenopausal women. Those who spent 21.7 or more hours per week in physical activity had a 20% reduction in breast cancer risk. The ORs were similar among Latinas (OR=0.79), African-Americans (OR=0.72), and Whites (OR=0.87).

2.2.11. Phytoestrogen intake (Table 11)

Phytoestrogen intake was estimated through a food frequency questionnaire that assessed frequency of consumption and portion size for over 100 food items (i.e., food groups or single items). To quantify the intake of seven specific phytoestrogenic compounds, we used a nutrient database developed by Dr. Pamela Horn-Ross, a co-investigator of this project (19). In our study, phytoestrogen intake did not decrease breast cancer risk as hypothesized. However, phytoestrogen intake in the non-Asian US population was relatively low. There may be threshold effect with a reduction in risk limited to higher levels of exposure (such as those consumed by Asian and Asian-American women).

2.2.12. Sun exposure variables (Table 12-14)

Tables 12-14 present preliminary findings on the vitamin D hypothesis. According to this hypothesis, we would expect breast cancer risk to be lower among women with high levels of sunlight exposure. Among White women, we found a trend of decreasing risk with increasing number of hours spent outdoors during the summer at age 25-30. No clear associations emerged among Latina and African-American women.

The interview included the measurement of non sun-exposed skin pigmentation (i.e., upper inner arm) and sun-exposed skin pigmentation (i.e., forehead). Two measurements were taken at each location, and the measurements were averaged. The difference between sun-exposed and non sun-exposed pigmentation was computed as an index of recent sun exposure. No association was found.

We hypothesized that women who protected themselves from the sun may be at increased breast cancer risk. No associations were found.

We hypothesized that women with light skin pigmentation would produce more vitamin D, and thus be at decreased breast cancer risk. No association was found. We expected that women who don't develop any burns when in the sun for the first time in the season would tend to spend more time in the sun, and thus be at decreased breast cancer risk. No clear associations emerged.

More detailed analyses on the sunlight exposure variables that incorporate the residential history are underway.

Table 1: Demographic factors and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Cases 469	Control 699	OR [b] 95% CI	Case 409	Control 460	OR [b] 95% CI	Case 448	Control 498	OR [b] 95% CI
Country of Birth												
US Born	1044	1123	1.0	233	223	1.0	401	448	1.0	410	452	1.0
Foreign Born	282	534	0.64 0.51-0.80	236	476	0.59 0.45-0.78	8	12	0.70 0.26-1.90	38	46	0.98 0.62-1.56
Education												
<=HS grad	551	856	1.0	276	522	1.0	166	201	1.0	109	132	1.0
Post HS	433	457	1.28 1.06-1.54	111	114	1.33 0.96-1.85	169	178	1.16 0.85-1.59	153	165	1.13 0.80-1.60
College Grad	339	344	1.22 0.98-1.52	81	63	1.56 1.03-2.36	73	81	1.06 0.70-1.60	185	200	1.05 0.74-1.50

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 2: Menstrual factors and reproductive surgeries and breast cancer risk The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Age at Menarche												
8-11	329	344	1.0	137	145	1.0	96	98	1.0	96	101	1.0
12-13	670	825	0.86 0.72-1.04	212	320	0.84 0.62-1.14	200	233	0.87 0.61-1.23	258	272	0.95 0.67-1.33
14+	313	476	0.76 0.61-0.94	116	229	0.68 0.48-0.97	108	125	0.88 0.59-1.31	89	122	0.75 0.50-1.13
Age at Menopause												
<45	312	426	1.0	109	170	1.0	129	148	1.0	74	107	1.0
45-54	400	530	1.01 0.83-1.25	121	224	0.89 0.62-1.26	109	122	1.14 0.76-1.70	170	184	1.15 0.81-1.63
55+	105	87	1.39 0.99-1.97	36	24	2.40 1.24-4.66	28	35	0.71 0.39-1.29	41	28	1.65 0.92-2.99
Menopausal Status & Type												
Pre	409	490	1.0	170	234	1.0	127	127	1.0	112	129	1.0
Post Natural	471	607	0.72 0.54-0.97	156	276	0.61 0.39-0.97	133	140	0.71 0.42-1.21	182	191	0.82 0.46-1.45
Post Surgical	350	446	0.73 0.55-0.97	112	146	0.87 0.56-1.33	134	169	0.61 0.38-0.99	104	131	0.70 0.40-1.22
Can't determine	89	109	0.79 0.55-1.12	27	42	0.73 0.41-1.31	14	22	0.49 0.22-1.08	48	45	1.04 0.59-1.85
Hysterectomy												
No	922	1156	1.0	338	530	1.0	255	281	1.0	329	345	1.0
Yes	367	461	0.95 0.80-1.13	110	144	1.23 0.92-1.65	145	174	0.90 0.67-1.20	112	143	0.77 0.56-1.04
Oophorectomy												
No	1034	1320	1.0	383	589	1.0	307	336	1.0	344	395	1.0
Yes	267	310	1.07 0.88-1.29	75	95	1.27 0.91-1.78	90	116	0.84 0.61-1.16	102	99	1.16 0.84-1.60

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 3: Reproductive factors and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Contr 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Nulliparous	217	187	1.0	65	39	1.0	60	54	1.0	92	94	1.0
Parous	1106	1470	0.84 0.66-1.07	402	660	0.59 0.37-0.96	348	406	0.81 0.52-1.25	356	404	1.02 0.69-1.50
Parity												
0	217	187	1.0	65	39	1.0	60	54	1.0	92	94	1.0
1-2	556	607	0.92 0.72-1.19	177	191	0.73 0.44-1.20	169	193	0.82 0.52-1.29	210	223	1.07 0.72-1.60
3-4	389	546	0.76 0.58-0.99	151	262	0.48 0.28-0.80	122	137	0.86 0.53-1.41	116	146	0.90 0.58-1.41
5+	161	317	0.58 0.42-0.81	74	207	0.34 0.19-0.62	57	75	0.60 0.34-1.08	30	35	1.07 0.55-2.06
Age at First Full- term Pregnancy (FFTP)												
<20	281	401	1.0	93	190	1.0	143	161	1.0	45	50	1.0
20-24	414	531	1.03 0.83-1.28	154	230	1.25 0.88-1.77	124	152	0.91 0.64-1.29	136	149	0.98 0.61-1.60
25-29	240	291	1.05 0.81-1.36	89	122	1.32 0.87-2.00	45	54	0.88 0.54-1.44	106	115	0.95 0.57-1.59
30+	156	198	0.94 0.69-1.28	60	79	1.07 0.65-1.75	32	31	1.12 0.61-2.07	64	88	0.71 0.40-1.28
Age at FFTP and Parity												
Nulliparous	217	187	1.0	65	39	1.0	60	54	1.0	92	94	1.0
1-2 Age<25	286	292	0.97 0.73-1.30	87	82	0.94 0.53-1.67	114	127	0.82 0.50-1.35	85	83	1.13 0.70-1.83
3+ Age <25	409	640	0.69 0.52-0.91	160	338	0.46 0.27-0.79	153	186	0.75 0.46-1.24	96	116	0.89 0.55-1.46
1-2 Age 25+	269	314	0.89 0.67-1.18	90	108	0.72 0.42-1.25	55	66	0.76 0.44-1.33	124	140	1.01 0.64-1.58
3+ Age 25+	127	174	0.78 0.56-1.10	59	93	0.64 0.35-1.15	22	18	1.07 0.49-2.31	46	63	0.77 0.44-1.33

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 4: Lactation and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Lactation												
Nulliparous	217	187	1.0	65	39	1.0	60	54	1.0	92	94	1.0
0	275	251	0.79 0.63-0.99	92	141	0.52 0.33-0.82	126	151	0.82 0.54-1.24	57	59	0.97 0.67-1.41
<6 mos	257	330	0.69 0.53-0.89	94	144	0.39 0.24-0.63	64	76	0.76 0.46-1.24	99	111	0.91 0.61-1.35
6-11 mos	195	303	0.57 0.44-0.75	71	136	0.31 0.19-0.51	51	76	0.60 0.36-1.00	73	91	0.82 0.54-1.25
12+ mos	156	292	0.49 0.37-0.65	78	198	0.24 0.15-0.38	46	47	0.87 0.50-1.51	32	47	0.68 0.40-1.17
Lactation among parous												
0	275	251	1.0	92	141	1.0	126	151	1.0	57	59	1.0
<6 mos	257	330	0.86 0.70-1.07	94	144	0.82 0.57-1.18	64	76	0.90 0.60-1.34	99	111	0.91 0.63-1.32
6-11 mos	195	303	0.76 0.61-0.96	71	136	0.76 0.51-1.12	51	76	0.68 0.45-1.05	73	91	0.89 0.60-1.34
12+ mos	156	292	0.82 0.63-1.07	78	198	0.83 0.55-1.26	46	47	1.17 0.71-1.91	32	47	0.66 0.38-1.14
Lactation and Parity												
Nulliparous	217	187	1.0	65	39	1.0	60	54	1.0	92	94	1.0
1-2 FTP Did not lactate	270	270	0.89 0.68-1.17	86	72	0.82 0.48-1.40	96	112	0.76 0.47-1.23	88	86	1.05 0.68-1.62
3+ FTP Did not lactate	222	268	0.73 0.55-0.97	71	108	0.45 0.26-0.77	90	93	0.83 0.50-1.36	61	67	0.89 0.55-1.44
1-2 FTP lactate <6 mon	155	177	0.80 0.59-1.08	50	68	0.55 0.32-0.97	43	39	0.92 0.51-1.65	62	70	0.91 0.58-1.44
3+ FTP lactate <6 mon	102	154	0.60 0.43-0.83	44	76	0.41 0.23-0.72	21	37	0.48 0.24-0.95	37	41	0.88 0.51-1.52
1-2 FTP lactate 6+ mon	126	159	0.72 0.53-0.99	39	51	0.58 0.32-1.05	29	42	0.59 0.32-1.09	58	66	0.95 0.60-1.50
3+ FTP lactate 6+ mon	225	436	0.52 0.40-0.69	110	283	0.34 0.21-0.56	68	81	0.69 0.41-1.16	47	72	0.66 0.40-1.07

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 5: Hormone use and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Oral contraceptives												
No	445	628	1.0	166	301	1.0	144	169	1.0	135	158	1.0
<5 years	373	540	0.97 0.79-1.20	142	240	1.15 0.82-1.61	96	130	0.84 0.57-1.25	125	170	0.80 0.54-1.18
5+ years	359	466	0.96 0.77-1.20	99	143	0.92 0.63-1.35	131	158	0.99 0.68-1.46	129	165	0.89 0.60-1.33
HRT												
No	735	904	1.0	299	435	1.0	273	274	1.0	163	195	1.0
<5 years	255	373	0.78 0.62-0.98	74	145	0.70 0.47-1.03	76	110	0.65 0.44-0.96	105	118	1.15 0.75-1.77
5+ years	313	354	0.94 0.75-1.18	84	106	0.94 0.64-1.39	56	70	0.76 0.49-1.17	173	178	1.14 0.77-1.70

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 6: Body composition and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Premenopausal women: BMI												
<26.3	169	172	1.0	70	62	1.0	32	35	1.0	67	75	1.0
26.3-31.3	109	145	0.83 0.58-1.18	46	86	0.52 0.30-0.89	38	38	1.17 0.57-2.40	25	21	1.46 0.71-2.99
31.4+	131	174	0.82 0.59-1.16	54	85	0.67 0.39-1.16	57	56	1.08 0.57-2.06	20	33	0.57 0.28-1.17
Postmenopausal women: BMI												
<26.3	303	350	1.0	82	117	1.0	67	77	1.0	154	156	1.0
26.3-31.3	283	380	0.96 0.77-1.21	104	172	0.97 0.65-1.44	87	105	1.06 0.67-1.66	92	103	0.92 0.64-1.34
31.4+	277	364	0.95 0.75-1.21	96	151	0.97 0.64-1.47	119	137	1.03 0.67-1.58	62	76	0.80 0.52-1.24
Postmenopausal women, no HRT Use: BMI												
<26.3	87	124	1.0	33	49	1.0	34	34	1.0	20	41	1.0
26.3-31.3	123	143	1.43 0.97-2.10	50	80	1.12 0.60-2.08	50	45	1.25 0.65-2.38	23	18	2.77 1.12-6.86
31.4+	138	161	1.32 0.90-1.95	53	77	1.18 0.63-2.22	68	67	1.12 0.60-2.09	17	17	2.09 0.80-5.51
Premenopausal women, HRT Use BMI												
<26.3	213	223	1.0	48	68	1.0	32	42	1.0	133	113	1.0
26.3-31.3	157	228	0.78 0.58-1.04	52	88	0.84 0.49-1.44	37	58	0.85 0.45-1.63	68	82	0.70 0.46-1.08
31.4+	136	199	0.78 0.57-1.07	42	71	0.78 0.44-1.41	50	69	0.88 0.48-1.63	44	59	0.64 0.39-1.06
Lifetime Weight Gain	397	439	1.0	139	174	1.0	84	90	1.0	174	175	1.0
<6.8 kg	443	539	1.01 0.83-1.22	169	244	0.98 0.71-1.34	130	137	1.06 0.72-1.55	144	158	1.06 0.76-1.46
6.8-18.1 kg	348	480	0.82 0.65-1.04	94	165	0.75 0.50-1.13	165	199	0.86 0.57-1.31	89	116	0.89 0.57-1.41
>18.1 kg												

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 7: Total caloric intake and breast cancer risk
The Bay Area Breast Cancer Study

n=2,882	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Total calories												
<1615	425	536	1.0	114	159	1.0	134	189	1.0	177	188	1.0
1615-2356	446	536	1.08 0.90-1.31	155	212	1.17 0.83-1.65	121	128	1.31 0.92-1.85	170	196	0.93 0.69-1.26
2357+	401	538	1.08 0.88-1.31	184	304	1.10 0.79-1.54	124	127	1.34 0.94-1.93	93	107	0.93 0.65-1.35

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 8: Medical factors and breast cancer risk
The Bay Area Breast Cancer Study

n=2983	ALL RACES			LATINAS			AFRICAN-AMERICANS			WHITES		
	Case 1326	Control 1657	OR [a] 95% CI	Case 469	Contr 699	OR [b] 95% CI	Case 409	Contr 460	OR [b] 95% CI	Case 448	Contr 498	OR [b] 95% CI
Benign breast disease [c]												
No	1056	1400	1.0	390	618	1.0	331	380	1.0	335	402	1.0
Yes	264	253	1.20 0.98-1.46	75	80	1.21 0.83-1.75	76	78	1.18 0.82-1.71	113	95	1.34 0.97-1.84
Family history of breast cancer												
No	1112	1468	1.0	406	649	1.0	347	398	1.0	358	421	1.0
Yes	211	189	1.40 1.13-1.75	61	50	1.85 1.22-2.81	60	62	1.16 0.78-1.72	90	77	1.29 0.92-1.83

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[c] More than 1 year prior to diagnosis/selection

Table 9: Physical activity and breast cancer risk in premenopausal women
Hours per week by type of activity
The Bay Area Breast Cancer Study

n=875	All Races			Latinas			African-Americans			Whites		
	Case 397	Control 478	OR [a] 95% CI	Case 165	Contr 225	OR [b] 95% CI	Case 123	Contr 126	OR [b] 95% CI	Case 109	Contr 127	OR [b] 95% CI
Exercise / Sports												
<0.4	94	159	1.0	56	104	1.0	27	38	1.0	11	17	1.0
0.4-2.6	153	159	1.41 0.98-2.04	61	65	1.41 0.82-2.42	44	40	1.51 0.75-3.05	48	54	1.22 0.48-3.15
2.7+	150	160	1.34 0.93-1.95	48	56	1.14 0.64-2.04	52	48	1.46 0.75-2.85	50	56	1.28 0.50-3.23
Chores / Walking / Biking	161	160	1.0	56	58	1.0	48	46	1.0	57	56	1.0
<4.0	151	158	1.04 0.75-1.45	63	63	1.18 0.67-2.07	55	54	0.93 0.52-1.67	33	41	0.96 0.50-1.83
4.0-9.4	85	160	0.74 0.51-1.08	46	104	0.67 0.37-1.19	20	26	0.78 0.36-1.69	19	30	0.77 0.35-1.71
9.5+												
Exercise / Sports / Chores / Walking / Biking												
<6.2	142	160	1.0	55	65	1.0	40	49	1.0	47	46	1.0
6.2-13.6	167	158	1.31 0.94-1.82	70	69	1.23 0.72-2.11	53	43	1.67 0.90-3.09	44	46	1.09 0.58-2.05
13.7+	88	160	0.78 0.54-1.13	40	91	0.64 0.35-1.14	30	34	1.05 0.53-2.11	18	35	0.51 0.23-1.14
Moderate or strenuous Jobs												
0	234	244	1.0	89	109	1.0	79	69	1.0	66	66	1.0
<10.2	87	117	0.84 0.59-1.18	43	55	0.99 0.58-1.67	20	25	0.73 0.35-1.50	24	37	0.78 0.41-1.52
10.2+	76	117	0.73 0.51-1.04	33	61	0.78 0.45-1.37	24	32	0.63 0.33-1.20	19	24	0.95 0.45-2.03
Total Physical Activity												
<9.1	169	160	1.0	65	63	1.0	50	46	1.0	54	51	1.0
9.1-20.7	129	158	0.86 0.62-1.20	52	73	0.87 0.50-1.50	45	44	0.95 0.52-1.74	32	41	0.78 0.40-1.51
20.8+	99	160	0.73 0.51-1.04	48	89	0.70 0.41-1.22	28	36	0.65 0.33-1.29	23	35	0.81 0.39-1.69

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 10: Physical activity and breast cancer risk in postmenopausal women
Hours per week by type of activity
The Bay Area Breast Cancer Study

n=1,906	All Races			Latinas			African-Americans			Whites		
	Case 843	Control 1063	OR [a] 95% CI	Case 275	Contr 428	OR [b] 95% CI	Case 267	Contr 312	OR [b] 95% CI	Case 301	Contr 323	OR [b] 95% CI
Exercise / Sports												
<0.4	283	352	1.0	103	197	1.0	99	89	1.0	81	66	1.0
0.4-2.0	244	355	0.76 0.60-0.96	83	126	1.03 0.69-1.54	71	105	0.66 0.43-1.02	90	124	0.55 0.36-0.85
2.1+	316	356	0.97 0.77-1.22	89	105	1.38 0.92-2.07	97	118	0.78 0.52-1.19	130	133	0.82 0.54-1.25
Chores / Walking / Biking												
<4.2	313	353	1.0	84	122	1.0	117	125	1.0	112	106	1.0
4.2-10.4	277	354	0.90 0.72-1.13	85	104	1.20 0.78-1.84	92	120	0.84 0.57-1.23	100	130	0.74 0.50-1.10
10.5+	253	356	0.96 0.75-1.22	106	202	0.95 0.64-1.42	58	67	1.00 0.63-1.56	89	87	0.98 0.64-1.51
Exercise / Sports / Chores / Walking / Biking												
<6.4	314	353	1.0	85	127	1.0	114	122	1.0	115	104	1.0
6.4-13.2	273	355	0.87 0.70-1.10	89	115	1.19 0.78-1.81	93	116	0.90 0.61-1.32	91	124	0.67 0.45-0.99
13.3+	256	355	0.96 0.75-1.21	101	186	1.05 0.70-1.57	60	74	0.95 0.61-1.48	95	95	0.95 0.63-1.44
Moderate or strenuous Jobs												
0	466	505	1.0	143	194	1.0	126	140	1.0	197	171	**1.0**
<8.9	199	279	0.79 0.63-0.997	64	106	0.83 0.56-1.24	70	76	0.98 0.64-1.49	65	97	**0.62 0.42-0.91**
8.9+	178	279	0.70 0.56-0.89	68	128	0.70 0.47-1.03	71	96	0.77 0.51-1.17	39	55	**0.65 0.40-1.03**
Total physical activity												
	337	354	1.0	97	115	1.0	108	109	1.0	132	130	1.0
<9.6	268	353	0.84 0.67-1.05	81	137	0.74 0.49-1.11	84	101	0.83 0.55-1.25	103	115	0.93 0.64-1.35
9.6-21.6	238	356	0.80 0.63-1.00	97	176	0.79 0.53-1.18	75	102	0.72 0.48-1.09	66	78	0.87 0.57-1.33
21.7+												

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 11: Phytoestrogen intake and breast cancer risk
The Bay Area Breast Cancer Study

n=2882	ALL RACES				LATINAS				AFRICAN-AMERICANS				WHITES			
	Case 1272	Control 1610	OR[a]	95% CI	Case 453	Contr 675	OR[b]	95% CI	Case 379	Contr 444	OR[b]	95% CI	Case 440	Contr 491	OR[b]	95% CI
Biochanin A																
<21.5	297	402	1.00		82	128	1.00		102	142	1.00		113	132	1.00	
21.5 - 42.3	323	403	1.13	0.91-1.41	96	149	1.15	0.76-1.73	113	115	1.37	0.93-2.03	114	139	0.99	0.69-1.43
42.4 - 81.8	318	402	1.06	0.94-1.18	126	158	1.18	0.97-1.45	81	126	0.96	0.78-1.18	111	118	1.07	0.88-1.30
≥81.9	334	403	1.07	0.99-1.16	149	240	1.03	0.90-1.18	83	61	1.24 *	1.06-1.46	102	102	1.08	0.94-1.23
Mean	76.0	78.2			91.1	101.3			57.5	53.2			76.3	68.9		
Genistein																
<479.9	304	402	1.00		102	163	1.00		112	141	1.00		90	98	1.00	
479.9 -783.7	321	403	1.01	0.81-1.25	105	158	0.93	0.64-1.37	83	102	1.03	0.68-1.54	133	143	1.02	0.69-1.51
783.8 - 1438.8	359	402	1.07	0.96-1.20	126	169	1.04	0.87-1.26	107	100	1.14	0.93-1.40	126	133	1.06	0.86-1.29
≥1438.9	288	403	0.97	0.90-1.05	120	185	1.00	0.87-1.14	77	101	0.97	0.83-1.14	91	117	0.94	0.81-1.09
Mean	1408.1	1503.3			1416.7	1483.6			1389.4	1446.1			1415.2	1582.1		
Daidzein																
<472.9	288	402	1.00		92	172	1.00		118	152	1.00		78	78	1.00	
472.9 - 747.1	344	403	1.16	0.93-1.45	120	159	1.22	0.84-1.78	95	100	1.23	0.83-1.81	129	144	0.92	0.61-1.38
747.2 - 1222.2	323	402	1.05	0.93-1.18	109	169	1.05	0.86-1.27	87	94	1.07	0.86-1.32	127	139	0.97	0.78-1.20
≥1222.3	317	403	1.03	0.95-1.11	132	175	1.13	0.98-1.29	79	98	0.99	0.85-1.15	106	130	0.93	0.80-1.08
Mean	1241.5	1305.6			1235.7	1249.8			1201.7	1232.8			1281.7	1448.2		
Formononetin																
<8.7	265	402	1.00		86	167	1.00		96	127	1.00		83	108	1.00	
8.7 - 19.6	318	403	1.22	0.97-1.52	102	170	1.14	0.77-1.67	100	101	1.48	0.98-2.22	116	132	1.19	0.80-1.77
19.7 - 39.5	353	402	1.14	1.02-1.27	137	155	1.29	1.07-1.57	90	107	1.04	0.84-1.29	136	140	1.15	0.94-1.40
≥39.6	336	403	* 1.09	1.01-1.18	128	183	* 1.14	1.00-1.30	103	109	1.09	0.95-1.26	105	111	1.09	0.94-1.25
Mean	36.9	35.1	*		38.2	36.7	*		34.0	34.1			37.9	34.0		
Total Isoflavones																
<1048.0	292	402	1.00		91	162	1.00		117	154	1.00		84	86	1.00	
1048.0 - 1648.3	332	403	1.08	0.87-1.35	113	157	1.11	0.75-1.64	86	95	1.20	0.80-1.80	133	151	0.89	0.60-1.32
1648.4 - 2773.6	349	402	1.08	0.96-1.22	124	167	1.09	0.89-1.32	99	101	1.12	0.91-1.38	126	134	1.01	0.82-1.24
≥2773.7	299	403	1.01	0.93-1.09	125	189	1.05	0.92-1.21	77	94	1.01	0.87-1.19	97	120	0.94	0.81-1.09
Mean	2762.4	2922.2			2781.8	2871.4			2682.6	2766.2			2811.1	3133.2		

	ALL RACES				LATINAS				AFRICAN-AMERICANS				WHITES			
	Case N=1272	Control N=1610	OR[a]	95% CI	Case N=453	Control N=675	OR[b]	95% CI	Case N=379	Control N=444	OR[b]	95% CI	Case N=440	Control N=491	OR[b]	95% CI
Coumestrol																
<119.3	285	402	1.00		86	139	1.00		100	151	1.00		99	112	1.00	
119.3 - 183.3	322	403	1.13	0.90-1.41	90	146	0.92	0.61-1.38	106	99	1.78	1.20-2.64	126	158	0.96	0.66-1.40
183.4 - 275.8	336	402	1.10	0.98-1.23	132	171	1.12	0.91-1.36	83	102	*	0.93-1.42	121	129	1.06	0.87-1.29
≥275.9	329	403	1.11 *	1.02-1.20	145	219	1.10	0.95-1.27	90	92	1.15 1.17	1.00-1.37	94	92	1.10	0.94-1.27
Mean	229.3	226.2			247.7	249.6			221.6	212.1			217.1	206.7		
Matairisinol																
<18.1	227	402	1.00		77	130	1.00		93	130	1.00		107	142	1.00	
18.1 - 30.3	334	403	1.25	1.00-1.56	123	158	1.42	0.95-2.11	86	106	1.17	0.78-1.77	125	139	1.20	0.83-1.73
30.4 - 49.3	363	402	1.15	1.03-1.29	120	181	1.09	0.89-1.34	95	103	1.17	0.94-1.45	148	118	1.31	1.08-1.58
≥49.4	298	403	* 1.05	0.96-1.14	133	206	1.07	0.93-1.23	105	105	1.14	0.98-1.32	60	92	* 0.96	0.82-1.12
Mean	38.1	39.5			40.7	44.0			40.6	39.8			33.2	33.0		
Secoisolaricirisinol																
<75.2	295	402	1.00		76	113	1.00		139	191	1.00		80	98	1.00	
75.2 - 122.1	338	403	1.20	0.96-1.49	119	186	1.07	0.72-1.60	118	103	1.59	1.10-2.29	101	114	1.06	0.70-1.60
122.2 - 175.4	273	402	0.98	0.87-1.10	95	202	0.83	0.68-1.03	66	86	*	0.82-1.25	112	114	1.11	0.91-1.37
≥175.5	366	403	1.09 *	1.01-1.17	163	174	1.14	1.00-1.31	56	64	1.01 1.03	0.88-1.19	147	165	1.04	0.91-1.18
Mean	144.1	137.9			161.3	144.9			114.0	109.5			152.4	154.0		
Total Lignans																
<103.6	281	402	1.00		64	120	1.00		129	178	1.00		88	104	1.00	
103.6 - 159.1	349	403	1.29	1.03-1.61	131	186	1.42	0.94-2.13	113	104	1.48	1.02-2.15	105	113	1.07	0.71-1.60
159.2 - 222.8	300	402	*	0.94-1.18	104	180	1.07	0.87-1.33	70	91	*	0.84-1.28	126	131	1.06	0.87-1.29
≥222.9	342	403	1.05 1.09	1.00-1.18	154	189	1.19 *	1.03-1.38	67	71	1.04 1.06	0.91-1.23	121	143	1.01	0.88-1.15
Mean	182.2	177.4	*		202.0	188.9			154.6	149.3			185.7	186.9		
Total Phytoestrogens																
<1337.2	300	402	1.00		89	160	1.00		129	158	1.00		82	84	1.00	
1337.2 - 2030.2	316	403	1.01	0.81-1.26	105	162	1.03	0.70-1.51	78	89	1.10	0.73-1.65	133	152	0.89	0.60-1.33
2030.3 - 3264.5	350	403	1.08	0.96-1.21	133	164	1.18	0.97-1.44	90	103	1.02	0.83-1.25	127	136	1.01	0.81-1.24
≥3264.6	306	402	1.01	0.93-1.10	126	189	1.08	0.94-1.24	82	94	0.99	0.85-1.16	98	119	0.95	0.82-1.10
Mean	3173.9	3325.8			3231.5	3309.8			3058.8	3127.6			3213.8	3526.9		

[a] Adjusted for race, age, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopause / HRT, total caloric intake

[b] Adjusted for age, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopause / HRT, total caloric intake

Table 12: Sun exposure and breast cancer risk
The Bay Area Breast Cancer Study

	All Races			Latinas			African-Americans			Whites		
	Case	Control	OR [a] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI
Hours/week Outdoors in Summer at age 10-15												
< 2hrs	213	322	1.0	103	202	1.0	45	48	1.0	65	88	1.0
3-4 hrs	397	463	1.16 0.93-1.46	155	187	1.43 1.02-2.02	111	122	1.0 0.60-1.64	131	154	0.94 0.62-1.43
5-6 hrs	327	402	1.09 0.85-1.38	93	136	1.16 0.79-1.71	98	121	0.89 0.54-1.47	136	145	1.06 0.69-1.61
7+ hrs	275	353	1.07 0.84-1.38	99	145	1.23 0.84-1.80	86	97	0.99 0.59-1.65	90	111	0.95 0.60-1.50
Hours/week Outdoors in Summer at age 25-30												
<1 hr	152	164	1.0	55	84	1.0	49	35	1.0	48	45	1.0
1-2 hrs	474	609	0.83 0.64-1.07	175	238	1.13 0.74-1.72	112	161	0.43 0.26-0.73	187	210	0.82 0.51-1.31
3-4 hrs	365	465	0.83 0.63-1.09	121	177	0.97 0.62-1.52	108	128	0.54 0.32-0.92	136	130	0.82 0.50-1.32
5-6 hrs	129	173	0.86 0.62-1.19	55	96	1.00 0.60-1.67	44	37	0.75 0.39-1.43	30	40	0.65 0.34-1.26
7+ hrs	95	134	0.86 0.60-1.23	47	76	1.21 0.71-2.09	28	29	0.62 0.30-1.25	20	29	0.69 0.34-1.43
Hours/week Outdoors in Summer at age 50-55												
<1 hr	146	145	1.0	41	68	1.0	52	38		53	39	1.0
1-2 hrs	267	386	0.68 0.51-0.91	86	140	1.01 0.60-1.69	68	107	1.0	113	139	0.60 0.36-1.00
3-4 hrs	168	174	0.94 0.68-1.30	53	64	1.32 0.73-2.36	54	44	0.46 0.27-0.78	61	66	0.63 0.36-1.11
5+ hrs	80	99	0.88 0.60-1.30	37	50	1.52 0.82-2.84	22	30	0.87 0.47-1.60	21	19	0.82 0.40-1.76
									0.51 0.25-1.06			
Pigmentation difference forehead - arm												
1 small	195	246	1.0									
2	275	305	1.13 0.88-1.45									
3	258	326	0.96 0.73-1.24									
4	252	326	1.00 0.75-1.32									
5 large	239	345	0.92 0.68-1.24									

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[c] Also adjusted for non-sun exposed skin pigmentation

Table 13: Sun protection and breast cancer risk
The Bay Area Breast Cancer Study

	All Races			Latinas			African-Americans			Whites		
	Case	Control	OR [a] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI
Sun Protection Shade												
No	645	792	1.0	226	312	1.0	214	233	1.0	254	290	1.0
Yes	572	755	0.98 0.84-1.16	226	360	0.93 0.72-1.20	128	157	0.98 0.72-1.33	168	195	1.03 0.78-1.37
Sun Protection Hat												
No	767	956	1.0	272	393	1.0	214	233	1.0	281	330	1.0
Yes	449	592	0.97 0.82-1.14	180	279	1.00 0.77-1.31	128	157	0.84 0.61-1.16	141	155	1.07 0.80-1.42
Sun Protection Long Pants												
No	824	1033	1.0	271	395	1.0	247	286	1.0	306	352	1.0
Yes	393	514	1.05 0.88-1.24	181	277	1.15 0.88-1.51	96	104	1.09 0.78-1.54	116	133	0.98 0.72-1.33
Sun Protection Long Sleeves												
No	879	1048	1.0	309	407	1.0	236	263	1.0	334	378	1.0
Yes	338	499	0.85 0.71-1.01	143	265	0.81 0.62-1.07	107	127	0.91 0.65-1.26	88	107	0.91 0.65-1.27
Sunscreen use												
Never	600	771	1.0	251	404	1.0	246	265	1.0	103	102	1.0
Sometimes	331	376	0.95 0.77-1.16	116	143	0.93 0.67-1.29	65	73	1.00 0.67-1.51	150	160	0.88 0.61-1.27
Half the time	84	108	0.81 0.60-1.13	17	30	0.64 0.33-1.24	11	16	0.72 0.32-1.62	56	62	0.89 0.55-1.43
Most of the t	116	162	0.75 0.56-0.99	35	43	0.95 0.56-1.61	13	16	0.76 0.35-1.67	68	103	0.62 0.40-0.96
Always	87	130	0.71 0.52-0.97	35	52	0.75 0.45-1.24	8	20	0.41 0.17-0.98	44	58	0.68 0.41-1.12

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

Table 14: Skin pigmentation and tanning and breast cancer risk The Bay Area Breast Cancer Study

	All Races			Latinas			African-Americans			Whites		
	Case	Control	OR [a] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI	Case	Contr	OR [b] 95% CI
Skin pigmentation												
1 dark	269	312	1.0									
2	246	335	1.03 0.76-1.39									
3	255	327	1.10 0.77-1.58									
4	259	322	1.03 0.71-1.50									
5 light	258	324	0.92 0.63-1.36									
Skin react 1 hr Hot sun												
Severe Burn/blister	124	110	1.0	44	69	1.0	19	13	1.0	61	99	1.0
Mod burn no blister	312	401	1.10 0.83-1.46	140	199	1.07 0.67-1.70	35	50	0.45 0.19-1.07	137	152	1.38 0.92-2.08
Mild burn	478	587	1.17 0.89-1.54	175	276	0.95 0.61-1.50	140	134	0.75 0.34-1.61	163	177	1.50 1.01-2.22
No burn	267	345	1.01 0.75-1.36	77	114	0.88 0.53-1.47	134	177	0.51 0.24-1.11	56	54	1.61 0.97-2.67
Skin react long period sun												
Deep tan	398	496	1.0	195	223	1.0	104	151	1.0	99	122	1.0
Moderate tan	405	465	1.11 0.92-1.33	124	194	0.89 0.66-1.22	110	107	1.35 0.96-1.90	171	164	1.26 0.91-1.74
Light tan	266	352	1.01 0.83-1.25	85	153	0.92 0.65-1.30	84	83	1.32 0.91-1.91	97	116	1.03 0.71-1.48
No tan	110	168	0.86 0.65-1.13	31	70	0.63 0.38-1.02	34	37	1.30 0.77-2.20	45	61	0.89 0.56-1.42

[a] Adjusted for race, age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

[b] Adjusted for age, country of birth, education, age at menarche, parity, lactation, family history of breast cancer, history of benign breast disease, composite variable of BMI / menopausal status / HRT

2.3. Technical Objective 2b: ***Compare breast cancer risk factors among cases and controls with regard to racial/ethnic differences in the prevalence of the established and hypothesized risk factors.***

Tables 15-24 present ethnic-specific data on the prevalence of the established and hypothesized risk factors among control women. For the exposures considered in this study, the prevalence tended to be highest/lowest among Latinas, intermediate among African-Americans, and lowest/highest among Whites, thus paralleling the incidence rates for breast cancer (i.e., lowest among Latinas, intermediate among African-Americans, highest among Whites).

Factors that may decrease risk: Latina women were more likely to be foreign-born and of low education (Table 15); to start menstruating at a late age and to stop menstruating at a young age (Table 16); to be parous, to have had 5 or more children, and to have breast-fed for 12 months or longer (Table 17); to have engaged in high levels of physical activity from all sources (Tables 22-23), and to have high phytoestrogen intake (Table 24); but they were less likely to have had a hysterectomy or oophorectomy (Table 16). The proportion of women who had their first child before age 20, however, was highest among African-American women (Table 24), as was the proportion of premenopausal women with a high BMI (Table 19).

Factors that may increase risk: Latina women were less likely to have used hormones (Table 18); to report a personal history of benign breast disease or a family history of breast cancer (Table 21); and they were more likely to have a high calorie intake (Table 20). African-American women, on the other hand, were more likely to have a high BMI after menopause and high weight gain (Table 19).

Table 15: Demographic factors among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Country of birth						
US born	223	32%	448	97%	452	91%
Foreign born	476	68%	12	3%	46	9%
Education						
High school graduate	522	75%	201	44%	132	27%
Some college	114	16%	178	39%	165	33%
College graduate	63	9%	81	17%	200	40%

* Percentages may not add up to 100 due to rounding

Table 16: Menstrual factors and surgeries among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Age at menarche						
8-11	145	21%	98	21%	101	20%
12-13	320	46%	233	51%	272	55%
14+	229	33%	125	27%	122	25%
Age at menopause						
<45	170	41%	148	49%	107	34%
45-54	224	54%	122	40%	184	58%
55+	24	6%	35	11%	28	9%
Hysterectomy						
No	530	79%	281	62%	345	71%
Yes	144	21%	174	38%	143	29%
Oophorectomy						
No	589	86%	336	74%	395	80%
Yes	95	14%	116	26%	99	20%

* Percentages may not add up to 100 due to rounding

Table 17: Reproductive factors and lactation among controls The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Nulliparous	39	6%	54	12%	94	19%
Parous	660	94%	406	88%	404	81%
Parity						
0	39	6%	54	12%	94	19%
1-2	191	27%	193	42%	223	45%
3-4	262	37%	137	30%	146	29%
5+	207	30%	75	16%	35	7%
Age at first full-term pregnancy						
<20	190	31%	161	40%	50	12%
20-24	230	37%	152	38%	149	37%
25-29	122	20%	54	14%	115	29%
30+	79	13%	31	8%	88	22%
Lactation						
Nulliparous	39	6%	54	13%	94	23%
0	141	21%	151	37%	59	15%
<6 months	144	22%	76	19%	111	28%
6-11 months	136	21%	76	19%	91	23%
12+ months	198	30%	47	12%	47	12%

* Percentages may not add up to 100 due to rounding

Table 18: Hormone use among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Oral contraceptives						
No	301	44%	169	37%	158	32%
<5 years	240	35%	130	28%	170	34%
5+ years	143	21%	158	35%	165	33%
Hormone replacement therapy						
No	435	63%	274	60%	195	40%
<5 years	145	21%	110	24%	118	24%
5+ years	106	15%	70	15%	178	36%

* Percentages may not add up to 100 due to rounding

Table 19: Body mass index and weight gain among controls The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		**AFRICAN-AMERICANS**		**WHITES**	
	Controls		Controls		Controls	
Premenopausal women:						
Body mass index						
<26.3	62	27% *	35	27%	75	58%
26.3-31.3	86	37%	38	29%	21	16%
31.4+	85	36%	56	43%	33	26%
Postmenopausal women:						
Body mass index						
<26.3	117	27%	77	24%	156	47%
26.3-31.3	172	39%	105	33%	103	31%
31.4+	151	34%	137	43%	76	23%
Lifetime Weight Gain						
<6.8 kg	174	30%	90	21%	175	39%
6.8-18.1 kg	244	42%	137	32%	158	35%
>18.1 kg	165	28%	199	47%	116	26%

* Percentages may not add up to 100 due to rounding

Table 20: Total caloric intake among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Total calories						
<1615	159	24%	189	43%	188	38%
1615-2356	212	31%	128	29%	196	40%
2357+	304	45%	127	29%	107	22%

* Percentages may not add up to 100 due to rounding

Table 21: Medical factors among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Benign breast disease						
No	618	89%	380	83%	402	81%
Yes	80	11%	78	17%	95	19%
Family history of breast cancer						
No	649	93%	398	87%	421	85%
Yes	50	7%	62	13%	77	15%

* Percentages may not add up to 100 due to rounding

Table 22: Physical activity among premenopausal controls The Bay Area Breast Cancer Study

	PREMENOPAUSAL CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Exercise / Sports						
<0.4 hrs/week	104	46%	38	30%	17	13%
0.4-2.6	65	29%	40	32%	54	43%
2.7+	56	25%	48	38%	56	44%
Chores / Walking / Biking						
<4.0 hrs/week	58	26%	46	37%	56	44%
4.0-9.4	63	28%	54	43%	41	32%
9.5+	104	46%	26	21%	30	24%
Moderate or strenuous Jobs						
0 hrs/week	109	48%	69	55%	66	52%
<10.2	55	24%	25	20%	37	29%
10.2+	61	27%	32	25%	24	19%
Total Physical Activity						
<9.1 hrs/week	63	28%	46	37%	51	40%
9.1-20.7	73	32%	44	35%	41	32%
20.8+	89	40%	36	29%	35	28%

* Percentages may not add up to 100 due to rounding

Table 23: Physical activity among postmenopausal controls The Bay Area Breast Cancer Study

	POSTMENOPAUSAL CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Exercise / Sports						
<0.4 hrs/week	197	46%	89	29%	66	20%
0.4-2.0	126	29%	105	34%	124	38%
2.1+	105	25%	118	38%	133	41%
Chores / Walking / Biking						
<4.2 hrs/week	122	29%	125	40%	106	33%
4.2-10.4	104	24%	120	38%	130	40%
10.5+	202	47%	67	21%	87	27%
Moderate or strenuous jobs						
0 hrs/week	194	45%	140	45%	171	53%
<8.9	106	25%	76	24%	97	30%
8.9+	128	30%	96	31%	55	17%
Total physical activity						
<9.6 hrs/week	115	27%	109	35%	130	40%
9.6-21.6	137	32%	101	32%	115	36%
21.7+	176	41%	102	33%	78	24%

* Percentages may not add up to 100 due to rounding

Table 24: Phytoestrogen intake among controls
The Bay Area Breast Cancer Study

	CONTROLS					
	LATINAS		AFRICAN-AMERICANS		WHITES	
	n	% *	n	% *	n	% *
Total Phytoestrogens						
<1337.2	160	24%	158	36%	84	17%
1337.2 - 2030.2	162	24%	89	20%	152	31%
2030.3 - 3264.5	164	24%	103	23%	136	28%
≥3264.6	189	28%	94	21%	119	24%

* Percentages may not add up to 100 due to rounding

2.4. Technical Objective 3. ***Perform attributable risk calculations in order to assess to what extent racial/ethnic differences in breast cancer incidence rates are due to racial/ethnic differences in the magnitude of association with established and newly hypothesized risk factors.***

Based on the magnitude of effects and prevalence of exposures found in this study, attributable risks will be estimated during the no-cost extension year.

3. KEY RESEARCH ACCOMPLISHMENTS

Key research accomplishments achieved in year 4 of the DOD funded project include:

- Completed collection of interview data and measurements for case and controls.
- Completed data entry and data cleaning, created variables for statistical analyses and analytic data files
- Completed a major part of the statistical analyses.

4. REPORTABLE OUTCOMES

Presentations: Dr. John participated in the Department of Defense Breast Cancer Research Program Meeting 'Era of Hope' in June 2000 and presented a poster and platform presentation on "Breast cancer risk factors in a multi-ethnic population".

Manuscripts: Several manuscripts are currently in preparation that include data from the DOD-funded component of the study:

(1) Phytoestrogen consumption and breast cancer risk in a multiethnic population.
(2) Lifetime occupational history and breast cancer risk.
(3) Occupational solvent exposure and breast cancer risk.
(4) Lifetime physical activity and breast cancer risk in premenopausal women.
(5) Lifetime physical activity and breast cancer risk in postmenopausal women.

5. CONCLUSIONS

The statistical analysis is well under way and will be completed during the no-cost extension year. A first look at the results suggests some differences in the magnitude of effects across ethnic groups. More importantly, the prevalence of the exposures of interest among controls varies considerably by ethnicity, suggesting that these differences may contribute to the observed ethnic differences in incidence rates. Attributable risk calculations will be performed to more formally address this issue during the no-cost extension year.

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